THE ZOOLOGIST.

THIRD SERIES.

Vol. V.] MARCH, 1881. [No. 51.

THE PAST AND PRESENT DISTRIBUTION OF SOME OF THE RARER ANIMALS OF SCOTLAND.*

By J. A. Harvie-Brown, F.Z.S.

II. The Marten.

According to the statistics at my disposal the Marten appears to be of rarer occurrence now than the Wild Cat, being extinct in many localities still frequented by the latter species, but curiously enough it seems to have survived over a wider area up to a later date. In other words, whilst the Wild Cat has retreated, and is only found now beyond the lines traced in my account of that species (p. 11), and was forced beyond them not later than 1875 (when one was got in Glen Tanar, Aberdeenshire), the Marten is still found at localities south and east of this line, or has been found at later dates. Thus, it is still not uncommon in Rothiemurchus, and it is not yet extinct in the Valley of the Tay, whilst one was killed as lately as 1879 in Glenartney (Perthshire), and in 1874 at Culzean, in Ayrshire—localities amongst others which have long been deserted by the Wild Cat. This will become more evident when the particulars of its retrogression are pointed out. It is not, however, always easy to decide whether the Marten can be considered as extinct in any given locality, because it is often found after long intervals frequenting localities which were famous for their numbers in former times. Severe winters may, and doubtless do, have some influence in causing them to wander farther and extend the area of their hunting-grounds, and thus they appear most unexpectedly, and after long previous absence. It is, I think, undoubtedly the case that they do wander over a large area, and they appear to be much greater wanderers than the Wild Cat.

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* Continued from p. 23.

The cause of the sudden decrease of the Marten in many localities is principally owing to their unsuspiciousness of a baited trap. Several correspondents distinctly affirm that "the baited trap has exterminated them." Besides this, rabbits, which have largely increased in many Highland districts, are now more systematically trapped, and the Marten being fond of rabbit, more frequently "puts his foot in it." A very large proportion of the records of Martens killed in later years show that they were obtained either accidentally in rabbit-traps, or in baited traps set on purpose for them. Had it not been for the sanctuaries afforded by the deer-forests, it is probable that they would have become extinct in the Highlands before now.

Martens linger longest where there is abundance of native pine woods, as is clearly shown in the following returns to any one who is acquainted with the topograpby of Scotland. Their power of concealing themselves must be very considerable if we look at the curious sporadical occurrences of the species at localities apparently long previously untenanted; but the true cause of these isolated occurrences, there is every evidence to prove, is the wandering habit of the species. They could scarcely for so long escape the rabbit-traps set in numbers in the Lowlands; and it is only amongst the rough boulder-strewed hillsides and old pine woods, or amongst the rank growth of heather, where comparatively few rabbits exist and are not systematically trapped, that Martens can long exist in security. Rabbit-trapping in the Lowlands, and game-preserving and baited traps in the Highlands, I believe to be the two principal factors in the exterminating process as regards the Marten. We cannot, owing to this wandering habit, so easily trace a boundary line between the districts inhabited and those uninhabited by the species, but a sufficiently accurate idea can be formed if the following notes be studied, map in hand.

South of Scotland.—The Marten is so extremely rare in all parts of Scotland south of the Firths of Forth and Clyde that I have failed in obtaining any tangible statistics of the dates of its extinction, except the few I give below, all others being negative, and little apparently being known about it by people in these districts. In Ayrshire Mr. J. Cairns, Kilkerran, and Mr. James Cox, gamekeeper, Culzean, both inform me of one killed, caught in a rabbit-trap on Culzean in the winter of 1874. In Kirkcudbright it is said to have been a dweller in the parishes of Colvend and Southwick at the date of the 'Old Statistical Account' (*op. cit.*, vol. xvii., 1796, p, 109). In some parts of the Cheviots it is believed still to exist in small numbers (Proc. Berw. N. Club, vol. vii., p. 505, and vol. viii., p. 527), and we have late evidence of its presence in Cumberland,* and elsewhere in England and Wales† not uncommonly.

Stirlingshire.—They have long been extinct, even in the wider parts, such as the shores of Loch Lomond, and even as long ago as the date of the 'Old Statistical Account of Scotland' it was spoken of as rare in several districts, but to have "lately appeared" in others, such as Campsie, amongst the rocks of the Campsie Fells ('Old Statistical Account,' vol. xv., 1794, p. 323). Thus, even in those days the appearance of the species at many places appears to have been irregular, owing no doubt to its predatory and wandering habits.

Dumbartonshire.—It is now believed to be extinct, as none have been killed since 1832, when one male and one female were trapped at the same bait on the same evening at Rossdhu. These are now in the collection at Rossdhu, as I am informed by Mr. Colquhoun, who tells me they were abundant at Rossdhu within his recollection, and were often trapped at the poultry-yard. Since the above was written, however, Mr. James Lumsden informs me that one was killed at Poachy Glen, near Renton, about fourteen or fifteen years ago (say 1865 or 1866).

Fife and Kinross, and South of the Ochil Hills.—Mr. Charles Cook, of Edinburgh, sends the following particulars of a specimen in his collection:—"My specimen, which is a full-grown male, was caught on May 19th, 1870, in an ordinary rabbit-stamp set for rabbits in the extensive woods on the slopes of the East Lomond Hill, in Fifeshire, on the Falkland Estate, by one of the gamekeepers. It was sent to me by Mr. James Lugton, the then headkeeper there. He had not seen or heard of any animal like it before in that neighbourhood, and he had been keeper there for many years." Mr. Cook is of opinion that it was a wanderer from the Perthshire highlands in search of a mate. "However, the woods where he was caught are very extensive, and it is just possible he may have been the last of his race." Since this male was obtained, however, another was killed in 1873 at Broomhall, near Dunfermline, the seat of Lord Elgin, by Mr. Stark, gamekeeper. This specimen was also a male.

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* Durnford, 'Zoologist,' 1878, p. 128. Parker, auct. Hope, 'Naturalist,' Edin.

† I possess the skin of one killed in Wales, which belonged to the late Dr. Saxby.

Perthshire.—None have been met with during the past thirty years, or since 1850, in the valley of the Allan between Perth and Stirling. It is not remembered as existing in the neighbourhood of Leny, Callander, but is quoted in the 'Old Statistical Account' (vol. xi., 1794, p. 598). Of late years, however, Martens have reappeared in that district and in the neighbouring forest of Glenartney, and other parts of S.W. Perthshire. Mr. Arthur S. Stark writes me that he "saw a Pine Marten in the wood behind Callander in the beginning of June, 1879." He adds:—"I was standing with my back against a tree watching some Cole Tits, when I noticed it hunting about, and, as it ran backwards and forwards not more than half a gunshot from me, I could make it out very distinctly with my binoculars. The chest-patch was very distinct." In Glenartney also one was killed so lately as February, 1879, on Drummond Castle Estate; and Mr. John Colquhoun heard that two were seen in the scrub-wood skirting the base of Ben Vorlich three years ago (say 1877). The last killed to the south of Glendochart was in 1871, on Suie property, by Mr. Macpherson, gamekeeper. It was considered by the people—natives of Glenartney—to have been extinct for thirty-five years at least, when the above one in 1879 was obtained. Mr. Duncan M'Gregor, who has been twenty-two years gamekeeper in the Glen of the Ruchil, in Glenartney, writes me concerning the above specimen:—"In March, 1879, however, one of Lord Aveland's men, going along the river (Ruchil), near the waterfall below Dalclathic Bridge, got one in his traps. It was bought by D. Rose, game-dealer in Crieff, for stuffing. No person can say how it came to this glen. My opinion is that, owing to the severity of the weather, it was forced to leave its northern hills, and followed the winding of one of the tributaries of the Tay to the lowlands, and when caught was probably trying to go back, but took the wrong stream." We must, however, in this connection, consider the two seen at the base of Ben Vorlich about 1877, as related above by Mr. Colquhoun. It has been extinct for twenty-five years, or since 1855, around Dupplin. One was killed on Lyndoch Estate by Mr. Grass, keeper of the late Lord Lyndoch, about 1845, or a little earlier. The tree on which it was shot is still called "the Wild Cat Tree," a large spruce on the road between Monedie and Pitcairney. Some were killed about twenty-five years ago on Balquhidder (say 1855), but it is supposed to be extinct now. In the Callander district "the baited traps have exterminated them." It has never been seen or heard of in the neighbourhood of Cromlix by the keeper, who has been there more than twenty years. At the date of the 'Old Statistical Account of Scotland' they were included as frequenting the parish of Comrie, and also Weem. Curiously enough, since the above was penned, news reached me of another killed on Stronvar, in Balquhidder, which will be found recorded in the 'Field' of 17th April, 1880. It was obtained by one of the keepers early in that month. Thus both of the two seen on Ben Vorlich, as reported by Mr. Colquhoun *ut. sup.*, are probably accounted for. Have they left any young ones behind them, or are these the *last*, until some unusually severe winter drives others to wander south again? Between Glen Almond and Glen Queich, about thirty years ago, some were killed, for Mr. J. Anderson remembers seeing them hanging up amongst vermin in the "gamekeeper's museum." This would be about 1850. In 1867 Mr. Dewar, keeper at Remony, killed a fine male, yellow-breasted, which is now in his collection at Finlarig, near Killin. None had been seen, according to Mr. Dewar, previously, since 1840, when one was killed by him at Remony, south side of Loch Tay; but Mr. Mackie, formerly keeper on Breadalbane, killed one about two miles from Loch Tay, at the falls of ——— ? about eighteen years ago (say 1862). It was at that time rare in the district, and people came a long way to see it. Mackie had noticed the tracks of some animal about the rocks, but could not make out what it was; he therefore set some traps, without bait, and got the Marten-cat. This is the last Mackie has heard of in that district.

On Mornish, Loch Tay side, adjoining Remony, one Marten is included in the list of vermin killed in 1868. I have to thank Mr. D. Dewar for this list of vermin, which presents many interesting facts in connection with the past and present numbers of some of our indigenous animals. In another list of vermin killed on Remony and Claggan Hill, between 1849 and 1855, no Martens are included, nor Polecats nor Wild Cats. As has already been seen, however, the Marten is not quite extinct in Perthshire. Dr. MacIntosh, of Murthly, writes me:—"One is occasionally seen making its way from the steep and wooded slope above the river to the asylum grounds. It was first observed last year" (1879). I had fully chronicled the reported occurrence of a Marten at Rednock, in S.W. Perthshire, as given in the papers, and reiterated by the person himself who caught the animal, now more generally known locally as "the Rednock beast"; but certain descriptions which reached me causing me grave doubts, I applied for corroborative evidence to various friends living in the district. After actually seeing it, all agreed that "the Rednock beast" was a common "coon," and none could imagine how it came to be designated a Marten. Whence this racoon came, no one appears able to say, but from the fine condition and sleekness of the beast it must have been at large some time.

Forfarshire.—During the last twenty-five years only two have been killed in the county, and these two about the year 1860, the one on Stracathro Estate, the other on Dun estate, male and female. The distance between the two estates is four miles. My informant, Mr. J. B. Smart, adds:—"It was thought that it was the severity of the weather that had driven the Marten-cats so far south, as none had been heard of for a long time previously anywhere in the county. They are believed to be extinct now in the county."

Argyleshire.—In this county Martens are becoming scarce. They were stated in 1792 to be extinct in Sunart, and "not so frequent as formerly" in Kilmorich and Loch Goilhead.* On Loch Awe-side the last killed were male and female, between Taighachregain (Taycreggan) and Taynuilt, in 1871. They are still to be met with, however, in Glen Etive, Glencoe, and the Black

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* 'Old Statistical Account,' vol. iii., p. 176.

Mount Forest, in which latter they are preserved. At the date of the 'Old Statistical Account' they were still found in Ardchattan and Muckairn. In Ardnamurchan a few were killed between 1856 and 1860, as I am informed by the proprietor, but none have been seen there since 1862, when the present gamekeeper first came there.

Aberdeenshire.—They are becoming decidedly scarce. Sixteen years ago (say 1864) Mr. Mackie, whose name is already mentioned under Perthshire, killed a pair at Littlewood, near Alford, with unbaited traps. Six Martens have been killed during the last ten years (1870—80) in Glen Tanar, as I am informed by Mr. Milne, forester. They linger here owing to the shelter afforded by the old pine woods, and from this sanctuary the two killed in Forfarshire in 1860 probably wandered. From the district of Buchan inquiries have elicited no positive evidence. They linger still in the S.W. of the county, as shown above, but the last heard of by Mr. George Sim, which was killed to the north of the city, was one killed in the woods of Ellon on the 1st June, 1874. Scarcely a season passes, however, without one or two coming from the neighbourhood of Lochnagar. On the 10th April, 1880, Mr. Sim had one from there, which had been killed only shortly before. "The flesh," Mr. Sim adds, "was quite fresh." They are still pretty numerous in parts of Braemar. Two were killed in Glen Derry two winters ago (1878—79).

Moray, Banff, Elgin, and Nairn.—Capt. Dunbar Brander, of Pitgaveny, informs me that a pair appeared in a wood near Burgh head, on the coast. They were caught and stuffed, and were for years in a gunmaker's shop in Elgin. This was about twelve or fourteen years ago (say 1866 to 1868). "Not the oldest poacher or keeper has ever seen one here—at Pitgaveny. It was a mystery how they came, or from where."

Invernesshire.—The Marten is still not uncommon in this county. It is reported as still common in Glenmore, Rothiemurchus, and Glenfeshie. James Grant, gamekeeper, left Glenmore three years ago, and killed many during his time there, dating from say 1877. It is still found in Badenoch, but is believed to be extinct in Ben Alder deer-forest, none having been seen for several years back. At Invereshie, during the past two years, four have been trapped by Mr. Sutherland (1879—80). For the same reasons given under Wild Cat, I do not mention here all the localities where I know it is still found, the object of these records being more to show the minutiæ of its past than of its present distribution, a general idea of the latter being sufficient for all practical purposes of the paper. North of the Caledonian Canal it is still common. In the deer-forests it is in a measure preserved, and not indiscriminately trapped. It is, however, becoming scarce in the neighbourhood of Fort Augustus. Had it not been for the deer-forests they would ere this have been extinct in the North of Scotland. One was killed at the last-named locality in 1877, or "about three years ago," and another thirteen or fourteen years ago (say 1866) by the keeper on Lord Lovat's ground. It is considered rare at Beaúly now, and generally in the east of the county. Only five have been taken on Struy since 1874. At Guisachan they were formerly common; five or six were trapped there annually up to 1870; since then they have become of rare occurrence. Alexander M'Gillivray trapped one at Plodda, one mile and a half from Guisachan House, in December, 1875. The last one obtained was trapped by Rory M'Gillivray in January, 1878, at Knockfin, two miles distant. These two specimens are white-breasted and yellow-breasted, and have been preserved, and are now in the gun-room at Guisachan. I am obliged to Sir Dudley Marjoribanks, Bart., for kindly putting the above notes at my disposal. Since the above was penned, I have been informed that two were taken in April, 1880.

Rosshire.—To Mr. Osgood H. Mackenzie, of Kinloch Ewe, I am much indebted for interesting notes on the Marten in Rosshire, of which the following is an extract. The last Marten killed in Mr. Mackenzie's district was on his own property twenty-five years ago (say 1855). He writes as follows:—" They had a most curious home on my ground, which is still called 'Clach more nan Taghan' ('the big stone of the Marten,') or, as my English friends call it, 'Castle Marten.' It is a carried boulder about ten feet high. The Martens had been killing sheep, and a fox-hunter having been sent for, day after day the track of the Marten was lost by the hounds always near this boulder. At last it was found that the Martens jumped from the ground on to a ledge in the side of the boulder, and had their young ones in a mass of peat on the top, which was perforated with their holes. They were dug out of this and killed. About eighteen or twenty years ago (say 1860—62) a number of Martens were killed at Dundonnel, and the late Miss Mackenzie, of Dundonnel, gave me a number of skins. When my mother, Dowager Lady Mackenzie, of Gairloch, was managing that estate for my brother, Sir Kenneth Mackenzie, who was then a minor, she used to get about thirty or forty Martens' skins every year, chiefly from the natural pine-woods of Kinloch Ewe. At Bein Damph, Torridon, Mr. Duncan Darrochs, keeper, killed two Martens two years ago." They have long been plentiful about Torridon, as the fir plantations are specially attractive. Mr. J. Colquhoun tells me that in 1863 six were trapped at Torridon in the winter time. They were described to Mr. E. R. Alston in August, 1880, as "almost, if not quite, extinct" now in the Loch Maree district. In Fannich Forest it is believed to be extinct. The present forester, a most observant naturalist, has never seen one there. It is believed to be extinct also in the East of Rosshire. In Strath Conan the Marten was very abundant at one time, but none have been seen there for twenty years (say 1860). The last killed was about that time. It had a white breast.

Harris and Lewis.—About twenty years ago they were abundant (say 1860). About five years ago (1875), when Mr. O. H. Mackenzie was stalking deer in Sir James Matheson's Forest of Mhorsgail, in The Lews, he met with a dead Marten, which had lost its life in a somewhat singular manner. I quote here Mr. Mackenzie's own words:—"I suddenly came to a place where there was a lot of wool scattered about, and there was every appearance of there having been a struggle between a sheep and some other animal. I knew there were a few stray sheep in the forest, but knowing there were no foxes in the island, we thought this sheep must have been attacked by an Eagle. I continued my stalk. About one hundred yards from where we found the wool I came upon a large Cheviot wedder lying dead, with its head down hill, and its shoulder jammed up against a stone which was sticking out of a bank. In passing I gave the fore-quarters of the sheep (which appeared to have been dead about a fortnight) a kick, and under its shoulder and neck lay a dead Marten. The wedder, in rushing madly down hill with the Marten at its throat, had dashed itself against the sharp stone, which killed the Marten. The sheep's throat being cut, it had not had strength to get upon its legs, but bled to death where it lay." On Park Lodge Shootings, as I am informed by Mr. Notman, the last seen was in 1869; in 1868, one; in 1867, one; 1866, three; 1865, three. Thus in five years, between 1865—69 inclusive, nine Martens were seen or killed.

Sutherlandshire.—In East Sutherland Martens are very scarce. Only two have been caught on Dunrobin during more than twenty years. One was got in Balblair Wood in 1860, and another in 1868 at Dunrobin. In other parts of the county it is not, however, so scarce. I have myself seen twelve Martens' skins in the possession of one keeper in Assynt in 1869, and I have heard of an equal number being killed in one season in the north of the county in 1877. That they are scarcer now than formerly, however, cannot be gainsaid. Mr. T. Mackenzie, anxious to procure a skin, employed about a dozen keepers in Sutherland. He did succeed in getting one, but only one, and he concludes that it is nearly "played out" in the county. Two fresh-slain Martens, however, were seen in M'Leay's shop on the 9th April, 1880, by Sir J. P. Campbell Orde, Bart., which were got in Sutherland, and since the above was written Mr. Mackenzie procured another very large old male. I hear also of one having been killed in the winter of 1879-80 in Assynt. Before that, I find that twenty-two were killed by one keeper between 1869—80, the largest number in one year being eight (in 1869), and the next largest being five (in 1870), whilst another keeper killed fifteen in 1870—1873 inclusive, and no more again until 1879-80.

No statistics illustrate better than these the rapid extermination of the species by the direct agency of man, and it is interesting, though melancholy, to note how the misfortunes of the dying races of the Marten and Wild Cat in these districts run parallel with one another.

Since writing the above I have learned that the Marten is probably nearly extinct in the Long Island. Mr. Mackenzie reports:—"A shepherd in Park district of the Lews says that about eight years ago he saw two Martens get out of a cairn from the keeper's dogs and make their escape; and that he has never heard of any being seen there since. There may possibly be some alive yet, but if so, they are confined to that part of the island. The late Sir James Matheson's piper, Mr. McKay, who came to the Lews many years ago, trapped many Martens, but no Polecats."

Errata.—Page 13, for "Souwick Glebe" read "Senwick Glebe," and for "Balmaangan" read "Balmangan."

ON ASIATIC BLOWPIPE FISHES.

By Francis Day, F.LS., F.Z.S.

On November 6th, 1879, I read a paper before the Linnean Society upon "Instincts and Emotions in Fish," which was printed in the Journal of that Society, Zoological series, vol. xv. In that article, at page 54, I observed that *Chelmon rostratus*, according to the account given by Hommel, ejects a single drop of water from its tubular mouth with which it is able to strike flies off plants into the water. The author of 'An Introduction to the Study of Fishes' has since remarked, with reference to this instinct of *Chelmon*, "This statement is erroneous, and probably rests upon the mistaken notion that the long bill is especially adapted for this manœuvre, which, indeed, is practised by another fish of this family (*Toxotes*)";* while in a popular account of fishes still more recently published by Mr. Seeley, there is an illustration in which the *Toxotes* is represented as thus employed, but with the head entirely raised above the surface.†

I propose adducing reasons for the belief, first, that the fish alluded to by Hommel was *Chelmon rostratus;* and, secondly, that it is physically impossible for it to have been a *Toxotes*.

The first published notice on the subject is contained in the 'Philosophical Transactions of the Royal Society of London' for 1764, vol. liv., p. 89, t. ix.,—"An account of a fish from Batavia, called Jaculator,"—respecting which Mr. Hommel, the Dutch Governor of the Hospital at Batavia, gave a very interesting account from hearsay:—"It frequents the shores and sides of the sea and rivers in search of food. When it spies a fly sitting on the plants that grow in shallow water, it swims on to a distance of four, five, or six feet, and then with a surprising dexterity it ejects out of its tubular mouth a single drop of water which never fails striking the fly into the sea, where it soon becomes its prey." Subsequently he "had some of these fishes caught and put into a tub of sea-water, which was changed every other day." When reconciled to their new abode, he had flies pinned on to a slender stick, and "it was with inexpressible delight that he daily saw these fish exercising their skill in shooting at the fly with an amazing velocity, and never missed the mark."

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* Günther, 'Introduction to the Study of Fishes,' p. 399.

† Cassell, 'Natural History'—Fishes, plate li.

Then follows a description of *Chætodon rostratus* of Linnæus (Mus. Ad. Frid., 1754, p. 61, t. 33), as being the species alluded to, the tubular-mouthed fish that knocked down insects at a distance of several feet by discharging at them a single drop of water. To obviate any misconception, a figure is given at plate ix., which is the fish alluded to, identical with Linnæus's *C. rostratus.* (See fig. 1 opposite).

In volume fifty-six of the same 'Transactions,' p. 186, occurs "Some further intelligence relating to the Jaculator-fish, mentioned in the 'Philosophical Transactions' for 1764, Article xiv., from Mr. Hommel at Batavia, together with the description of another species by Dr. Pallas, F.R.S., in a letter to Mr. Peter Collinson, F.R.S., from John Albert Schlosser, M.D., F.R.S."

Here the account of the Jaculator is continued, and Mr. Hommel remarks:—"With the closest attention I never could see any part of the mouth out of the water, though I have very often seen the Jaculator fish shoot a great many drops one after another, without leaving its place and fixed situation. No more than two different species of this fish are found here. The first and rarest kind is that which I sent before; and to the description published in the fifty-fourth volume of the 'Philosophical Transactions' the foregoing account may be added. You will now receive from me a specimen of the second species, which is the most common here."

A figure of this second species, termed *Sciæna jaculatrix,* is added (see fig. 2 opposite), leaving no doubt as to its being the fish now known as *Toxotes jaculator,* but to which the foregoing account *does not refer,* as expressly observed. While Pallas, in his 'Spicilegia' (1770, fasciculus 8, p. 41), when alluding to this second form, or *Sciæna jaculatrix,* which he terms "Sciænis *vel Sparus,*" very properly omits all suggestion as to its being endowed with shooting propensities, because such were not attributed to it by Hommel or Schlosser.

Pallas in his 'Spicilegia,' *l. c.,* figures a third form (see fig. 3 opposite), which he terms *Sparus insidiator,* and also attributes to it the same habit of shooting insects as was assigned to Hommel's first fish. He adds a figure which most unquestionably refers to an *Epibulus,* as observed by Cuvier and Valencienne (vol.

xiv., p. 111). Thus up to 1770 only two species of fishes were recorded as shooting flies; the first by Hommel, from personal observation, of which a specimen sent to Europe was figured in the 'Philosophical Transactions,' and identified as *Chætodon rostratus* of Linnæus; the second, whose habits were only vouched for by general repute, was an *Epibulus*, and has been figured by Pallas. No one, that I can ascertain, had asserted that the *Sciæna jaculatrix*, now known as *Toxotes jaculator*, with its deeply cleft mouth, was able to use it as a blowpipe.

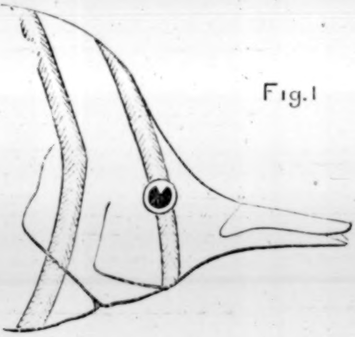

Fig.1

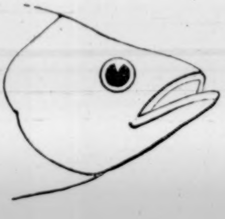

Fig.2

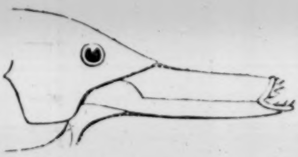

Fig.3

Fig. 1. *Chætodon rostratus.* Phil. Trans. 1764, p. 89, t. ix.
Fig. 2. *Sciæna jaculatrix* = *Toxotes jaculator.* Phil. Trans. 1766, p. 86.
Fig. 3. *Sparus insidiator.* Pallas, 'Spicilegia,' 1770, p. 41.

Even if we possessed no figure of Hommel's *jaculator*, it would be a physical impossibility that *Toxotes* was referred to by him. In fishes of this genus the mouth is deeply cleft, its angle being below the middle of the eye; its lips are thin, and closely investing the jaws; its tongue is covered with teeth, free at its edges, and terminating anteriorly in an obtuse point. It has no means of shaping its mouth into a tubular form, and it must be conceded that, with such a head *kept entirely under water*, it would be impossible to propel a drop of water *through the water*, to reach the surface, as described in the case of *jaculator*. This is so self-evident, that the artist in Cassell's plate has elevated the whole of the fish's head out of the water; having accomplished which, it no longer accords with Governor Hommel's description of facts wherein he observes, "I never could see any part of the mouth out of the water."

This brings us face to face with the following question: Is Governor Hommel's account inaccurate? It certainly does not refer to *Toxotes*. I accepted it as pertaining to *Chelmon*, which is figured, while the statement is now said to be *erroneous*.

In the 'Edinburgh New Philosophhical Journal,' 1828, is a paper by Mr. James Mitchell, "On the Jaculator fish of Java, or *Chætodon rostratus*, Linn." He gives a very interesting account of what he observed in December, 1822, at the house of a Javanese chief who lived within a mile of the town of Batavia:—

> "The fish was placed in a small circular pond, from the centre of which projected a pole of two feet in height. At the top of this pole were inserted small pieces of wood, sharp-pointed, and on each of these were placed insects of the beetle tribe. The placing of this pole and insects by the slaves had disturbed the tranquillity of the fish, so we had to wait some considerable time before they began their operations. But this delay was amply recompensed by the amusement they afterwards afforded us. When all had been tranquil for a long time, they came out of their holes and swam round and round the pond. One of them came to the surface of the water, rested there, and after steadily fixing its eyes for some time on an insect it discharged from its mouth a small quantity of watery fluid, with such force and precision of aim as to force it off the twig into the water, and in an instant swallowed it. * * * * I was informed that these fishes were originally imported from China, and are now the only specimens alive in Java, although about fifty years ago they were in the possession of several of the Javanese chiefs."

He adds that, from the view he had of them, which was only in the water, they appeared about five or six inches in length, rather short in the body, with blackish stripes variously interspersed. This second observer thus confirms Governor Hommel's statement, while he likewise considered the fish to be *Chætodon rostratus* of Linnæus.

I will now pass on to consider when this power of shooting insects with a drop of water was first attributed to the *Sciæna jaculatrix,* now known as *Toxotes jaculator.* In 1788, Gmelin, in his edition of "Linnæus," p. 1244, gave *Chætodon rostratus,* Linn., as identical with the Jaculator fish, referring to the paper of Schlosser, 1764, vol. liv., p. 9, t. 89, observing:—"Victitans insectis supra aquam volitantibus, in quæ rostro tubuloso exquisitissime explodit guttulam." At page 1282 he gives *Scarus Schlosseri,* which he considered as identical with Pallas's fish ('Spicilegia,' viii., p. 41), which is *Sciæna jaculatrix* of Schlosser (Trans. Roy. Soc.), and he does not suggest that this fish shoots insects. At p. 1273 he inserts *Sparus insidiator* of Pallas, which is an *Epibulus,* adding, "Oris in longissimum tubum emissilis ope, Chætodontis rostrato more insecta aquatica prædans."

Bonnaterre, 'Encyclopedique et Méthodique,' 1788, followed Gmelin, and in 1802 Lacépède did the same, but gave, in vol. iii., pp. 425, 463, a *Labrus jaculatrix,* and in vol. iv., pp. 5, 17, a *Scarus Schlosseri,* these two forms being evolved from the *Sciæna jaculatrix,* Schlosser, the "*Sciænis vel Sparis*" *jaculatrix* of Pallas.

The next author was Shaw, who, in vol. iv. of his 'General Zoology,' 1803, describes *Scarus Schlosseri* as identical with Gmelin's species, p. 1282, or Pallas's form, in note, p. 41, which is the same as that in the 'Philosophical Transactions,' vol. lvi., and wherein no notice is taken of its shooting insects; while this fish with a figure taken from the 'Transactions' likewise appears at p. 485 as *Labrus jaculator,* and is said to be a "native of the Indian seas, preying on insects in the same manner as *Chætodon jaculator.*"

Omitting other authors, we may well pass on to Cuvier and Valencienne's grand 'Histoire Naturelle des Poissons,' in which, at vol. vii., p. 310, this question is considered, but without the production of any new evidence on the subject; and it is decided that *Sciæna jaculatrix* is to be known as *Toxotes jaculator,* Cuv. & Val., also that it discharges drops of water at insects. In the same work it is also accepted that Governor Hommel's account referred to *Chætodon rostratus,* Linnæus, or *Chelmon rostratus,* Cuv. & Val., while he merely referred to one species of fish.

Now another change is proposed. Hommel is supposed to be wrong; the fish figured with a tubular mouth is assumed to have none such, and not to keep it below the surface; and the species therefore must have been erroneously recognised when sent to Amsterdam! I am of course unaware upon what grounds Dr. Günther's opinion has been formed, but cannot help thinking that he, not Hommel, is in error.

A few years since, the late Dr. Bleeker, just prior to commencing the ninth volume of his magnificent 'Atlas Ichthyologique,' spoke to me respecting the assertion that *Toxotes* shoots insects with a drop of water propelled from its mouth. "An interesting exercise of ingenuity," observed that celebrated ichthyologist, "for which the form of its mouth seems totally unadapted, a plan I have never seen it adopt when resident in the East; was unable to hear anything about in Batavia, where I made enquiries; nor could I meet with anyone there who had personally witnessed it or had any confidence in its occurrence." In his paper on "*Toxotes*," published in Amsterdam in 1875, he observed, respecting this faculty attributed to fishes of the genus, "Je crois aussi que la célébrité n'est pas méritée, et ne repose que sur une erreur."

Personally I paid special attention to this question when investigating the fishes of Burma, but no fisherman had ever heard of this ingenuity being attributed to *Toxotes*, and which I cannot help thinking, with the late Dr. Bleeker, must be an error. That such a faculty in a fish exists can hardly be disputed, but how a tubular-mouthed species which remains some moments immovable before shooting a drop of water at an insect—during which time its entire head is under water—has become transformed into a form possessing a deeply-cleft mouth, which raises its head out of its native element to take a flying shot at an insect, I leave for explanation to Dr. Günther and Mr. Seeley. Until some evidence in support of their views is adduced, I prefer accepting the statements of Hommel and Mitchell, as well as the published figures and identification of the species by Schlosser and Pallas, to whom the example was transmitted from Batavia. Even if it can be proved that *Toxotes* ever shoots insects with water, this would not disprove the positive statements of Hommel and Pallas, the former having witnessed the occurrence he described, and the latter having correctly determined the species to be what is now known as *Chelmon rostratus*, Cuv. & Val.

NOTES AND OBSERVATIONS ON BRITISH STALK-EYED CRUSTACEA.

BY JOHN T. CARRINGTON, F.L.S., AND EDWARD LOVETT.

INTRODUCTION.

IN the course of a series of papers, it is our intention to record what we should prefer to term "Notes and Observations on British Stalk-eyed Crustacea," in which we propose to give a short description of various species, together with local variations, local names, methods of capture, and particulars as to habits, &c., that from time to time have come under our notice. If any apology were needed for such a course, we think it may be found in the extremely scanty knowledge of the Crustacea that exists even among many naturalists. At present our scientific publications contain little or nothing in the shape of contributions on the subject, and the works of authority thereon may be counted on the fingers of one hand. The result of this naturally is that the knowledge of our British Crustacea is confined to very few, and the difficulties, more imaginary than real, which attend their study, deter many from giving attention to this most interesting and instructive branch of zoology. It is with the idea of drawing attention to this subject, and of removing some of the difficulties referred to, that we propose to write this series of papers, and we shall feel fully rewarded for any trouble taken in the matter if we succeed in making the study of Crustacea more popular.

If any proof were needed of the paucity of information on the subject of Crustacea amongst the public generally, we may mention that one of the leading London daily papers recently referred to crabs and lobsters as *molluscs*. This reminds us of a student who, when asked by his examiner what a crab was, replied that it was a red fish which walked backwards. The professor remarked that with the trifling exceptions that it was not red, nor was it a fish, and that it did not walk backwards, he was quite right.

Probably the first thing which the intending student of this group will discover, is, that no recent manual of the Stalk-eyed Crustacea is to be obtained. This is, of course, a serious drawback for one commencing the study. Nevertheless, one need not be disheartened, for with a little trouble we can find almost all we require. In English, the best book is the late Professor Bell's 'History of the British Stalk-eyed Crustacea,' published so long ago as 1853. At the date of its publication it was no doubt all that could be desired, but since 1853 several species have been added to the British fauna, and many which he considered rare are no longer so. This work will be found indispensable, for with the plain descriptions are beautifully-executed woodcuts of every species then recognised as British. Following in his wake the late Adam White compiled a useful little book entitled 'A Popular History of British Crustacea.' This brought the subject down to 1857, with several additions to our fauna. White gives short descriptions and a few additional localities other than those mentioned by Bell. Mr. P. H. Gosse, in 1855, published his 'Manual of Marine Zoology,' in which, of course, he alludes to the Crustacea, but gives only generic descriptions. For the species added to our fauna since 1857 we have to search through scattered papers in various scientific journals, published not only in London, but also in the provinces. It is hoped that there may be issued shortly a synonymic list (which will be useful also for cabinet labels), bringing the subject up to the present time.

For the classical work on the Crustacea we have to go to our neighbours, the French; the 'Histoire Naturelle des Crustacés' of M. Milne Edwards, published in Paris in 1834, being the work of all others on the group. It treats of all species known to the author at the date of publication, and refers not only to the Stalk-eyed, but also to the Sessile-eyed, Crustacea. The scientific descriptions are in French, but are easily read. The arrangement used by M. Milne Edwards is the one generally followed at the present time.

Amongst the earlier English writers on the subject, perhaps the most important was Dr. William Elford Leach, who, in 1815—17, published his 'Malacostraca Podophthalma Britanniæ, or Descriptions of the British Species of Crabs and Lobsters.' This fine work contains quarto plates, with coloured figures of many species. We need hardly remind our readers that Dr. Leach was Curator of the British Museum up to 1821, but died in Italy when scarcely past middle age, quite broken in health and intellect. Pennant, in his 'British Zoology' in 1777, gives some plates of British Crustacea. Montagu, in 1804, described those species known to him as occurring on the Devonshire coast.

Continental writers on the subject include Linnæus, in the twelve editions of his 'Systema Naturæ,' from 1735 to 1766; Fabricius, in his several works on Insecta (1775 to 1787) refers to this group; Herbst, from 1790 to 1804, published his fine work, 'Versuch einer naturgeschichte der Krabben und Krebse,' profusely illustrated with sixty-two coloured plates; Lamarck (1801); Latreille (1805); Risso (1815); Roux, 'Crustacea de la Mediterranée' (1828); and others of more or less importance.

For a work on the anatomy of these animals, all students should carefully read Professor Huxley's recently published manual on "The Crayfish."* This treatise once mastered, little trouble will be experienced with the anatomy of other members of the *Podophthalma*.

The next subject to be referred to is the distribution of the British Crustacea, and this is so general that the difficulty would be to find a part of our coasts where some species or other does not occur, though some localities are more favoured than others, and the connection between some species and the geological character of the coast line is of sufficient interest and importance to be particularly noticed when we come to treat of the species referred to. Rock pools, sandy, and even muddy shores, as well as deep water, all yield their various species, and a few words as to methods of capture may be acceptable. It is here that some difficulties present themselves, for it is not always convenient or possible to go on dredging or fishing expeditions oneself, and, as the numerous dredgers and trawlers of our coasts are undoubtedly the best sources from whence to obtain specimens, it is very desirable to be able to explain the species or genera that are required. This is extremely difficult, owing to the local names which almost everywhere exist, and by which alone the specimens are there known. It is only by becoming conversant with such local nomenclature, and by overcoming the propensity which fishermen have of throwing away all "rubbish," that most valuable species may at times be obtained, and often in large quantities. Other sources which may be personally worked are lobster and crab pots, which are used in large numbers on the more rocky parts of the coast, and about which we hope to say more when we come to treat of the species which are most frequently taken in them. Shore-hunting at extra low tides and in good rock pools is very remunerative sport to the collector, many rare forms often turning up quite unexpectedly. Any shore after stormy weather will inevitably yield a good harvest of storm-tossed, but frequently perfect, specimens.

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* Reviewed in 'The Zoologist,' 1880 p. 153.

Having briefly referred to their capture, the next question which naturally arises is their preservation, and this has always appeared a serious difficulty. Should it be undesirable or inconvenient, as is generally the case, to set up the specimens at once, they must be preserved in such a way as to prevent decomposition, loss of colour, or breakage. For this purpose an admirable medium is Cooper's disinfecting salt, which we have found to be best used in a moist state. This is a new double salt formed of the chlorides of sodium and calcium, the action of which upon the soft parts of the integument forms an albuminate of lime.* Specimens which we have preserved in this manner have come out quite fresh and bright after an interval of many weeks. Simply bury the specimens, not in one mass, but distributed through the salt, in any ordinary tin or other box, large-sized biscuit tins being convenient.

We will now explain our *modus operandi* of preservation and arrangement for the cabinet. Specimens which have been in the salt must be carefully soaked and washed in fresh water before dissecting, in order that not a trace of the material may be left to crystallise on them afterwards. Freshly captured specimens should also be similarly treated, though not necessarily so thoroughly as the "pickled" ones. When this has been done drain off the superfluous moisture, and remove the carapace by cutting round the under edge with a knife, or, in the case of lobsters, prawns, and similar forms, remove the abdominal segments from the thorax, and then clean out as much as possible of the internal structure, even of the smallest specimen. A little powdered alum should then be sprinkled over the interior, and if the specimen be one with a thin carapace some cotton-wool, tinted according to the colour of the animal under treatment, may be inserted in order to restore the natural appearance which is lost by removal of the membrane lining the exo-skeleton. When the carapace has been readjusted, place the specimen on a piece of soft board, and arrange the legs, antennæ, eyes, when on long stalks, in symmetrical position with pins. Then place the specimen where it will dry slowly, but surely, without being exposed to too much heat or any light. It is important always to keep specimens as much as possible in the dark, or they will soon bleach. It is advisable, also, that they should never be exposed long for exhibition, and never in powerful sunlight. By attending to these simple directions a collection will retain its natural beauty for years, although, where form alone is the desired object, these precautions may of course be dispensed with.

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* This salt may be obtained (in bulk only) from Mr. Cooper, 7, Westminster Chambers, S.W.

It is scarcely necessary to observe that the frequent use of a note-book is most desirable, so that all particulars as to locality, mode of capture, condition of specimen and appearance when fresh, may be recorded. By this means valuable scientific facts are often preserved, and real assistance rendered to future students.

The embryology of the various species being a subject of great importance, is one upon which, from time to time, we hope to record our observations.

Zoæa, or larvæ of Crustacea, all of which are of the most remarkable form, have more than once been described as distinct species. Even the ova of the Crustacea are so remarkable and varied that it is not only possible to identify most of the species by an examination of their ova alone, but the habits of a species may often be ascertained by the manner in which these ova are attached to the swimmarets of the female specimen. The apparent discrepancy in relative size is also most striking. To illustrate this we will mention one instance :—The ova of *Axius stirhynchus* are larger than those of *Palinurus quadricornis*, although the average length of the former animal is three inches and that of the latter eighteen inches.

When treating of the British species in detail we propose to iuclude the Crustacea of the southern shores of the British Channel, especially those species which occur in the Channel Islands. We shall also consider as British those obtained at a reasonable distance from our shores, whether in deep water or otherwise.

(To be continued.)

OCCASIONAL NOTES.

Otters in Hampshire.—Although some of our few indigenous British quadrupeds are gradually becoming scarcer in some localities, it is gratifying to state that in this locality the Otter is still a "native," although mercilessly persecuted whenever opportunity affords. During 1880 I know of some eight or nine having been caught. In the early part of the year a small specimen was shot by a man who was lying in wait for the morning "flight" of wildfowl, and as the year advanced one was killed in the New Forest. During the summer three or four were caught at different localities on the River Avon, and another—which I was told was a very large one—was caught in the little stream which divides the counties of Hants and Dorset, whilst another, much to the surprise of its captor, was trapped in a dyke at some distance from any main stream of water.—G. B. Corbin (Ringwood, Hants).

Squirrel swimming.—Never having heard of the Squirrel taking to the water, I send the following authentic communication. I had heard the story told by another person, and thinking it of sufficient interest I requested her to get it in detail from the lady under whose personal observation it had come. This the latter has most kindly complied with, and I forward it, trusting it may prove of interest to readers interested in the habits of animals:—"Mountquhanie, Cupar, Fife. When rowing two ladies down Loch Voil, one afternoon last August, I observed what looked like a little stripe of red-brown fur in the middle of the loch. On coming nearer we saw that it was a Squirrel swimming across, its tail lying flat on the water. We then heard its claws scratching on the side of the boat, and, to our surprise, the little bedraggled sprite appeared on the bow of the boat. It was evidently tired, for it sat quite still, staring at us and panting. I rowed on towards the shore, hoping to be able to ferry it across, but after a few minutes it scrambled down to the water again and resumed its journey, probably frightened at the sight of the collie dog which was in the boat. We watched it swimming till it looked like a small speck close to the shore, but lost sight of it before it landed." Loch Voil, in Perthshire, near Balquhidder, is about four miles in length, with a mean breadth of about one-third of a mile—a considerable extent of water for so small a rodent to face and cross, in search, I suppose, of new nutting-grounds.—H. H. Godwin-Austen (Thalford House, near Guildford).—'*Nature*,' Feb. 10.

[Although the swimming powers of the Squirrel are not referred to in Bell's 'British Quadrupeds,' and are unnoticed by many good observers who have written on the habits of animals, instances of this kind have been previously observed and recorded. See 'Zoologist,' 1872, p. 3272.—Ed.]

THE WHITE-BEAKED DOLPHIN.—Allow me to correct an error into which Mr. J. M. Campbell has been led with regard to the destination of the skull of Mr. Brightwell's White-beaked Dolphin; it is not in the British Museum, as stated in the Museum 'Catalogue of Seals and Whales,' and elsewhere, but in the Museum of this city; the origin of the error I have explained at p. 422 of 'The Zoologist' for 1879. The Yarmouth specimen was landed on the 25th August, 1878, not 1876, as stated in 'The Zoologist' for 1881, p. 42. The skull of the latter is also in the Norwich Museum.—T. SOUTHWELL (Norwich).

BREEDING OF THE SNOW BUNTING.—I fear that Mr. Charles Whymper's beautiful drawing of the Snow Bunting's nest which embellishes the January number of 'The Zoologist' may convey to those who have never had the pleasure of finding or seeing one *in situ* an erroneous impression; and as I find that in my history of this bird, to which Mr. Cordeaux has referred in such kind terms, I have omitted to state, so prominently as I ought to have done, one remarkable and (so far as I am aware) invariable characteristic of its mode of nidification, I should like to say a few words on the subject here. The Snow Bunting is a bird in which I have taken very great interest ever since the time when I first made its acquaintance, and my opportunities of enjoying its society, especially in its breeding-haunts, have been numerous. I must have found for myself considerably more than a dozen of its nests, in every case by watching the movements of the hen-bird, and I must have seen *in situ* at least as many others, all found, if I remember right, in the same way. Not one of them was exposed to the sky, as is represented in the plate, and, from what I have heard or read of others, I think I am justified in declaring that the Snow Bunting does not build its nest in such a position, but always under cover. I may add that only in one instance do I remember having been able even to see the nest without removing the stems which protected it, and more than once, after I have found where it was placed, it has been quite inaccessible—owing to the long and tortuous hole, the size of the stones, and the absence of any engineering tools. In one single case only did accident assist me in discovering the nest, and even then so abundant were the chinks, in one of which I knew it was, that we had to wait till the hen-bird showed us which of them led to it. In all other cases the discovery was the result of patient and often long watching, but watching that was never wearisome to me; and I can only attribute the ill-success that has attended many attempts on the part of some no mean bird-nesters to bad weather or want of time. I must take this opportunity of demurring to the statement made by your correspondent, Mr. W. Oxenden Hammond (*supra* pp. 65, 66), as to his having seen a pair of Snow Buntings, in June, 1872, "in one of the highest and wildest passes of the Maritime Alps." I have little doubt that he has made the mistake which has been made many times before, as I have elsewhere remarked (Yarrell's Brit. B., ii., p. 8, note), and that the species observed by him was the Snow Finch, *Montifringilla nivalis*—a very different bird.—Alfred Newton (Magdalene College, Cambridge).

Breeding range of the Snow Bunting. — With reference to the note by Mr. W. Oxenden Hammond (p. 65) on the occurrence of the Snow Bunting, as seen by him in the highest parts of the Maritime Alps in June, I think it very probable he has mistaken for our Arctic Bunting a very beautiful Alpine bird, the Snow Finch, *Montifringilla nivalis,* the "Alpen Schneefink" of the Germans. I am the more led to this conclusion from the fact that the locality stated as the nesting-quarters of his bird, a crevice under the window-sill of an Alpine cabin, is a very improbable position for the nest of a Snow Bunting, but a very probable one for the Snow Finch to choose. This pretty bird, which at even a short distance might easily be mistaken for the Snow Bunting, is in the summer an inhabitant of the highest and most desolate regions of the mountain ranges of Southern Europe, and here, far above the forest region and amidst perpetual snow, it finds a congenial home. It is said to nest beneath the roofs of the Hospice at the summit of the Great St. Bernard, but more frequently in some hole or crevice in the rocks. In a foot-note, 'Yarrell's British Birds,' ed. iv., vol. ii., p. 8, the editor, Professor Newton, remarks:—"The Snow Finch (*Montifringilla nivalis*), from its general resemblance to the Snow Bunting, has in several cases been the cause of error as to the occurrence of the latter in the South of Europe. The bill and hind claws, however, afford ready characters whereby the one bird may be distinguished from the other."—John Cordeaux (Great Cotes, Ulceby).

Habits of the Lyre-bird.—At a meeting of the Natural History Society of Glasgow, held in that city on the 30th November last, the Chairman (Mr. John A. Harvie Brown) exhibited the egg and specimens of the tail of the male and female Australian Lyre-bird, *Menura superba,* and read an interesting communication from Mr. C. W. Arnott Stewart regarding the habits and haunts of this species, from personal observation during his residence in the colony. The home of the Lyre-bird is in the deep, well-watered gulleys, where the vegetation is very dense. Fern trees grow in large numbers, and to a great height, sometimes to nearly forty feet. Sassafras, myrtle, and here and there a giant gum-tree, add variety to the forest, these latter being often of great size, and reaching a height of nearly 500 feet. During the middle of the day the birds take up their quarters in these dark gulleys, and it is only in the evening and early morning that they are to be found in any number on the mountain-sides. They are very shy, and exceedingly quick, so that it is no easy matter to shoot them in the bush, where there is so much cover. As they can only soar down hill, it is the custom when stalking them to begin at the bottom and work upwards. At the roots of the trees are seen mounds resembling mole-hills, but larger and more regularly formed, which have been scratched up by the male birds, and are their dancing beds, on which they dance and twirl, showing themselves off before the females. It is when amusing themselves in this way that the male mocks all the other birds in the bush, and so perfectly does it imitate them that it is only by its bringing in its own whistle now and then that it can be discovered. The nest is difficult to find, and is built of twigs, with an arch of the same over it, resembling the broad handle of a basket. It is said they lay only two eggs in the year, and the second is not laid until the first is hatched; but whether the same nest is used is not quite certain. The tail of the male bird brings seven shillings and sixpence, and is consequently much sought after; a good number are destroyed, but they are now protected by law during the breeding season. Dogs are sometimes employed for hunting them, and are trained to keep the birds in the trees into which they have hopped, by continually barking at them until those in search of them come up.

Migration of Birds.—At the same meeting, Mr. Harvie Brown read some notes on the migration of birds, with special reference to specimens of the Glossy Ibis, *Ibis falcinellus*, and the Esquimaux Curlew, *Numenius borealis*, which had been shot on the mud-flats at the mouth of the river Ythan, in Aberdeenshire, this year, and had been forwarded by Mr. George Sim, of Aberdeen, who gave the various measurements and contents of the stomachs of each. Some doubt was for a time entertained as to whether the Curlew was *N. minor*, the Asiatic ally, or *N. borealis*, but by comparison with other specimens it had been fully identified as being the latter species; but he thought the question of identity was not of much moment, because, bold as the assertion may appear, the matter of a few thousand miles in the migration of birds is comparatively of little importance, as the simultaneous appearance of rare migrants upon our coasts, hailing both from north-eastern and from north-western habitats has been noticed during the same prevailing winds, and at the same time. It is known that birds do not travel willingly directly with the wind, but prefer to fly against it, or partly against it, during migration, and the prevailing trend of migration is from east to west, or from south of east to north of west, as has been clearly shown by the lighthouses and lightships returns for 1879. He then gave particulars regarding the migration of rare species, other than those mentioned, and stated that the opinion of several naturalists who have paid attention to this subject has been gradually gaining ground, that a large proportion, if not all, of the sixty-seven species of North American birds which have from time to time visited Europe, have not come from the west across the Atlantic, or *viâ* Iceland and the Færoes, but in company with the innumerable rare migrants which are annually identified on the island of Heligoland, and which have their breeding haunts in Siberia and Kamschatka, and have come to us and other European countries from the east and north-east, across the great plains of Siberia, just as Pallas's Sand Grouse did when visiting Europe in 1873. He concluded by drawing attention to the importance of recording, along with the capture of rare birds upon our shores, the meteorological phenomena of the time of their arrival. Were this always done by the recorders some real service might be rendered to science by the accumulation of valuable data.

NESTING HABITS OF THE COMMON BUZZARD. — Near our village of Gosforth is a small valley, watered by the little River Bleng, and hence called Blengdale, which for the last four years has been constantly haunted by a pair of Buzzards. The sides of the valley rising abruptly on each side of the river are very steep and covered with grass. There are no crags, however, in it, and only some eight or nine trees, which trees contain every year three or four nests of the Carrion Crow. Rather than quit their accustomed ground, the Buzzards built their nest last year in a common thorn-bush growing about forty feet up the slope. Hearing of this unusual nesting-place, I went to examine it, but arrived too late. The nest was there, about eight feet from the ground, being apparently based upon an old crow's nest, but the three eggs, which were remarkably well-coloured specimens, had been taken that morning by a neighbouring gamekeeper. Exactly a month afterwards I revisited the locality, and found that the obstinate birds still held possession. About three hundred yards higher up the valley than the thorn-bush was a small "scar," twenty-five feet high, out of which grew a stunted tree holding a fresh nest containing three eggs, on which the hen-bird was sitting. Scrambling down to it from above, I found this second clutch almost as well coloured as the first three, which the keeper had meanwhile placed under a tame hen Buzzard. She sat upon them for thirty-one days, and hatched all three; but in spite of the united care of bird and keeper they all died when about ten days old. The old bird always sucked and chewed a piece of meat for three or four minutes before she gave it to the young ones. About three weeks afterwards we procured a half-grown Buzzard from a third nest on Seat Allan and gave it to the tame one to rear, but this also she failed to accomplish. I have four eggs in my collection which were laid by this tame Buzzard. On one occasion we put some hen's eggs under her, which she hatched and reared. Another tame Buzzard near here was hatched and brought up by a bantam-hen, the difference in size between the two being most absurd. The above case is only the second instance I have met with of a Buzzard nesting in a tree, as in this district they usually prefer the cliffs and crags of our mountain-sides.—CHARLES A. PARKER (Gosforth, Carnforth).

GREAT GREY SHRIKE NEAR RINGWOOD.—On the 8th of November when walking near the river, my attention was attracted to the number of Pied Wagtails flitting here and there over the reed-beds; this, however, being a usual habit of the birds in question at that season of the year, it excited but little surprise. I noticed that large numbers of them were congregated at a particular spot at some considerable distance from where I was standing, and that they seemed all noise and commotion. Curiosity prompted me to watch for the cause of this apparent uproar, and presently I saw a bird rise up from the vicinity of the reeds, closely pursued by the whole body of Wagtails. I was quite at a loss to say what bird it could be, as it was so far off. At first sight I thought it was a Fieldfare from the length of its tail, but I noticed—although it soon settled again—that its flight was different, being undulating, and reminding one somewhat of that of the Green Woodpecker, or even of the Wagtails themselves. Being continually mobbed, at last the bird rose high over the river, and fought its way through the host of its tormentors to some tall trees not far from me. I then distinctly saw it was a Great Grey Shrike, and was much interested, as it was the first living specimen I had ever seen. When it had settled amongst the trees the Wagtails left it, satisfied, I suppose, that they had driven it from their own quarters, but it was a curious sight to watch the determined manner in which the Wagtails made their attacks, and the turnings and twistings of the Shrike in its endeavours to evade them. On returning from my walk the Shrike had disappeared, and I have not seen or heard anything of it since. I may state that I have a specimen which was killed near here on the 12th January, 1876, and I have seen another killed previously, but I am uncertain about the date of the latter. The bird I saw in November appeared to have a much lighter breast than the two above named, but this, I suppose, was a mark of its nearer approach to maturity. Since writing the foregoing I have heard that a Great Grey Shrike was killed in this neighbourhood at the end of November, and in all probability was the bird I saw.—G. B. CORBIN (Ringwood, Hants).

ROUGH-LEGGED BUZZARD IN SURREY.—On February 7th a fine specimen of the Rough-legged Buzzard was trapped by Martin, the keeper to my friend. Mr. Alfred Eastly, on his shooting near Chesham, Surrey. On inquiry Mr. Eastly writes me that three of these birds have been seen in the neighbourhood for some time past, and that a male was shot by Mr. Cheeseman, keeper, in October. The remaining one, a male, is still about. I can find no account of this bird being taken in Surrey before, and therefore think it worthy of note.—PHILIP CROWLEY (Waddon House, Croydon).

Wren's Nest in January.—On January 13th a farm-labourer took, at the village of Broughton, about a mile from this place, a Wren's nest with seven eggs in it, all quite fresh. Has such a find ever been made in January before? I do not recollect either to have heard or read of such a thing, and the fact seems to me worthy a line in your periodical. The weather for some time previous to the present severity was unusually mild. —John H. Willmore (Queenwood College, near Stockbridge, Hants.)

Ivory Gull in Yorkshire.—I have pleasure in recording the captnre of the Ivory Gull by a York gentleman at Filey, in September last. I examined the bird myself at one of our York birdstuffers (who had it to case), and found it to be a male bird in perfect mature plumage, *i. e.*, entirely white. A young one was also captured the same month at Filey, and is in the beautiful mottled plumage of immature birds. These two birds are, so far as I can ascertain, the third and fourth respectively ever shot in our county. One of the previous ones is recorded by Yarrell as having been obtained in the neighbourhood of Scarborough, and the other one is mentioned by Mr. J. Cordeaux, in his 'Birds of the Humber District,' p. 203, as shot on the east coast of Yorkshire. I have also to record the capture of a male Smew and a male Goosander, both in splendid winter plumage, in the neighbourhood of Pickering. The gizzard of the Smew contained a fish like a small dace, and when I examined it was entire, except the head, which was probably digested.—J. Backhouse, jun. (West Bank, York).

White's Thrush in Devonshire.—A good specimen of this Eastern Asiatic Thrush was killed by Mr. E. Studdy in Dene Wood, near Ashburton, Devon, during the severe cold weather in January last. It was in company with three or four birds of apparently the same species, and when flushed was mistaken for a woodcock from its heavy flight. The species was first observed in England in 1828, as recorded by Yarrell, and the example now under notice appears to be the ninth that has been obtained in England since that date. The species is best known from Japan and China, and was described by Pallas under the name of *Turdus varius*. The specimen last killed was exhibited by me at a meeting of the Zoological Society on the 15th inst., and the species was fully recognised.—E. W. H. Holdsworth (84, Clifton Hill, St. John's Wood.)

[This makes the sixteenth instance in which *Turdus varius* has been reported to have been met with in the British Islands. A dozen instances are recorded in the 'Handbook of British Birds,' published in 1872, since which date four others, including that above noticed, have been recorded. See 'Zoologist,' 1874, p. 3880; 1879, p. 133; and 1880, p. 68.—Ed.]

Errata.—P. 54, for "Royal Philosophical Society," read "Royal *Physical* Society of Edinburgh." P. 66, for "Felbrigge," read "Selbrigge."

MEMOIR OF THE LATE JOHN GOULD, F.R.S.

Zoological science has sustained no slight loss in the death of Mr. John Gould, F.R.S., which took place at his residence in London, on the 3rd February last, at the ripe age of seventy-seven.

For more than forty years Mr. Gould's name has been intimately associated with Ornithology, of which science he was justly regarded as one of the leading exponents; and the magnificently illustrated folios which he published from time to time have rendered his name familiar, not only to naturalists all the world over, but to those whose positions and means enable them to cultivate a taste for the artistic and beautiful.

Mr. Gould's first important work, 'A Century of Himalaya Birds,' appeared in 1832. This was followed in 1834 by his 'Monograph of the Toucans,' a second edition of which was published in 1854. In 1837 he commenced his 'Icones Avium,' which was completed the following year, and which contained descriptions and figures of many new and rare birds from different parts of the world. In 1837 also his important work on the 'Birds of Europe,' in five vols. folio, was finished, and it was on the completion of this that he conceived the idea of visiting Australia, with a view to investigate its then almost unknown fauna, and attempt a general history of the Ornithology of that vast region so interesting to naturalists. To accomplish this, it was evident that a personal visit to Australia was necessary, for without this it would be impossible to furnish more than the bare nomenclature and description of form and colour of such species as might at uncertain intervals be collected and transmitted to him. To gain a just and accurate knowledge of the habits, manners, migration, food, and nidification of the birds of Australia, subjects on which next to nothing was then known, he felt that he must himself sojourn in their native wilds, and watch them in the grassy plain, the tangled bush, and the gloomy forest. Animated by the spirit of a Wilson or Andubon, he determined to leave England for Australia, and trust for the repayment of the heavy expenses which such an expedition would entail, to the success of his work, to which, that it might be worthy of public patronage, he resolved to devote his time, mind, and resources.

No sooner was the determination made than it was executed. Accompanied by Mrs. Gould, whose pencil was to be employed to illustrate his work, and also by an able assistant, in the person of John Gilbert, who afterwards, unfortunately, lost his life at the hands of the treacherous natives of the west coast during Leichardt's Expedition, he left England in May, 1838; and in September of that year arrived at Van Diemen's Land. Here he spent ten months in exploring that island and the islands in Bass's Straits. By way of interlude, however, he paid a short visit to New South Wales.

This hasty trip, which he extended to the Liverpool range, prepared Mr. Gould for his great expedition, and enabled him to procure both specimens and skins of the Lyre bird, *Menura superba*, the former of which he transmitted to Professor Owen for dissection. While in Van Diemen's Land, he was most cordially received by the Governor, Sir John Franklin, whose Polar Expedition all are familiar with, and who, being himself a man of science, and consequently capable of appreciating the value of Mr. Gould's undertaking, afforded him every assistance. While making Van Diemen's Land and Bass's Straits the theatre of his operations, Mr. Gould took the opportunity of visiting Flinder's Island, interesting from its intermediate situation between the Australian Continent and Van Diemen's Land. Some of its productions, as might be anticipated, are common to both; its general fauna, however, is that of the latter.

While in Van Diemen's Land, Mr. Gould separated from his principal assistant, John Gilbert, whom he sent to the western coast of the Australian Continent, while he himself proceeded to the south coast, making Adelaide his rendezvous. Here he was liberally supported in the prosecution of his enterprise by the Governor, Colonel Gawler, and Captain Sturt. By these gentlemen he was furnished with the requisites for a campaign, and with trusty attendants. According to the advice of Captain Sturt, Mr. Gould proceeded to explore the Bush, or "Great Scrub," which, for the extent of a hundred miles, borders the Murray; and he advanced nearly to the west bend of that noble river. The Scrub which Mr. Gould penetrated stretches over a dead level, and is about twenty miles in width and a hundred in length. It is composed of a close mass of brush-like trees, amongst which dwarf *Eucalypti* and *Pittosporums* are abundant. In this vast plain, which Captain Sturt, in his overland journey from Sydney to Adelaide, had previously traversed, and where he was struck with the novelties around him, Mr. Gould remained between two and three months, and was well rewarded for his toil by the riches of the country, to him not desert, but tenanted by beings of the highest interest—birds and mammals new to science, and of varied forms and habits.

From this wilderness, which the foot of white man had seldom trod, and which no zoologist had ever explored, he descended to the coast, and crossed to Kangaroo Island. In this spot, covered with a dense forest of *Eucalypti*, but which holds out no inducements to the settler (for forests do not here, as in America, indicate the value of the soil to the colonist), Honey-eaters were hovering about the flowers, and glancing in the sun; and the rugged coast was tenanted with Hawks and Eagles, which there find a secure abode. The Wallaby Kangaroo was seen in herds, and other mammalia were also plentiful.

Desirous of being in New South Wales at the breeding season of the birds, Mr. Gould now left the southern coast, and arrived at that place in August. Here he received from the Governor-in-chief, Sir G. Gipps, the most important assistance, given in the most kindly spirit. Two or three trusty convict servants were assigned to him, and he was further supplied from the government with tents, and the necessary utensils and materials for leading the life of a bushman. His attention was first directed to the thick tracts of brush and the small islets at the mouth of the River Hunter. These islets consist of a deep alluvial soil, and are covered with the most luxuriant vegetation, the densest foliage. From the midst of a thick underwood rise numerous palms and huge fig-trees, entwined by creepers of the most graceful and fantastic forms. Birds of the richest hues, Honey-eaters on restless wings, Regent-birds, Satin-birds, and beautiful Wood Pigeons (*Vinago*) enlivened by their presence these umbrageous wilds, and added charms to the scenery. It was here that Mr. Gould met with that extraordinary bird, the wattled Talegalla, or Brush Turkey of the colonists, of which so little was previously known that naturalists were divided as to whether it belonged to the vultures or the gallinaceous birds.

From the mouth of the Hunter, Mr. Gould tracked its course to its rise in the Liverpool range of hills, stopping in various parts for the purpose of collecting specimens and making observations. Fortunately for him it happened that a near relative (a brother of Mrs. Gould), Mr. S. Coxon, resided on the Dartbrook, a branch of the Hunter, nine miles from the base of the mountain chain. Here Mr. Gould not only occupied a most favourable position, but was enabled to command every advantage requisite both to render his examination of the flat tracts of this district successful, and also his excursions to the range itself, in the ravines and gullies of which he encamped for some time. This mountain range, which abounds with Lyre-birds, Black Cockatoos, and with many species of Kangaroo, is about one hundred and sixty miles from the sea at Newcastle, and two hundred and thirty east of Sydney, forming the limits of the colony in that direction. Hitherto Mr. Gould had only explored the country between the coast and this mountain chain, but the districts beyond these mountains were too inviting, and promised too many novelties to the naturalist, to be left unvisited. Accordingly he made preparations for crossing the range, and pushing his way to the distant interior by way of the Liverpool plains, which stretch out from the base of the mountains. In the accomplishment of this enterprise Mr. Gould was materially assisted by Mr. Coxon, who supplied him with bullocks and drays. He started on this expedition in December, with a party consisting of five Europeans and two intelligent natives, whose services he found highly valuable. After encamping for some time on the Rivers Mokai and Peal, he descended the Namoi, to the distance of about two hundred miles from the mountains. As was to be expected, he found the productions of these plains altogether of a different character from those between the mountains and the coast at Sydney. In the place of forests of timber or vast plains of brush, the country was for the most part open, covered with a peculiar vegetation of grasses, and here and there variegated with thinly-timbered forests. Thousands of beautiful Grass Parrakeets, and flocks of the little Crested Parrot (*Nymphicus*), and of Rose-breasted Cockatoos, were seen in every direction, restless and busy. The elegant Frill-neck (*Calodera nuchalis*), a bird of extraordinary habits, graced the woods with its presence; but neither the Satin-bird, the Regent-bird, nor the

Wood Pigeon, were to be seen. Emus were wandering over these plains, uttering their hollow, drumming notes, and troops of Kangaroos were quietly reposing in their primitive pasture-grounds. Of the latter animals Mr. Gould discovered several new species, some of gigantic size, and capable of overcoming the strongest and boldest of his dogs.

After an absence of six months Mr. Gould returned to Sydney, where he received letters and collections from Gilbert, who subsequently proceeded to the north, making Port Essington his principal station.

We have said that, while making Van Diemen's Land the centre of his operations during the first months of his arrival, Mr. Gould paid a hasty visit to New South Wales. It happened to be during one of the severest droughts ever known in the country. Little or no rain had fallen for fifteen months; the rivers and pools were all dried, the land was a parched waste, vegetation was burnt up, and famine was spreading destruction on every side.

When, after an absence of five months, however, Mr. Gould returned to the same place, an extraordinary change had passed over the face of the country. The rain had copiously fallen, and the plains on which but a short time previously not a blade of herbage was to be seen, and over which the stillness of desolation reigned, were made green with luxuriant vegetation. Orchids and thousands of flowers of loveliest hues were profusely spread around, as if Nature rejoiced in her renovation; and the wheat shooting up vigorously, gave promise of a plenteous harvest.

Suddenly hosts of caterpillars made their appearance, and inundating the country commenced their work of devastation; but not unchecked, for in the train of these destroyers came vast flocks of birds attracted by their prey. Hawks of three or four species, in flocks of hundreds, were busy at the feast; and thousands of straw-necked Ibises (*Ibis spinicollis*) and other birds were performing their allotted parts and benefitting man, while they revelled in the profusion of, to them, a welcome banquet.*

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* For most of the details above given of Mr. Gould's travels in Australia we are indebted to an article in the 'Westminster Review,' written, if we are not mistaken, by the late Mr. D. W. Mitchell, on the appearance of the first part of the 'Birds of Australia,' which was published in December, 1840.

Mr. Gould had now been actively and successfully engaged for two years in collecting not only the birds, but the mammals and other natural productions of Australia; and in that space of time had gained, as he said, "a rich harvest of knowledge." Many considerations now induced him unwillingly to return to England, and after a safe voyage he arrived in London in August, 1840, bringing with him as the fruit of his enterprise the finest collection of natural history specimens which it has perhaps never fallen to the lot of one man to procure. Not the least interesting portion consisted of the nests and eggs of all or nearly all the species (numbers of them new to Science) of which he had a series in every stage of plumage.

He at once prepared to utilise these collections, and having paved the way by the issue of his 'Synopsis of the Birds of Australia,' 1837-38, commenced his magnificent work on the 'Birds of Australia,' in seven folio volumes, which, being issued at intervals in parts, was not completed until 1848, and was followed by a supplement in 1851. Before the publication of this important work had commenced, however, such was his industry that he had completed, in 1838, a Monograph of the Trogons, a group of birds inhabiting America, India, and Africa, whose beauty and brilliancy of plumage is surpassed only by the Humming Birds. Of this a second edition was subsequently produced between the years 1858-75. In 1844 he commenced his Monograph of the American Partridges (*Odontophorinæ*), and in 1849 a Monograph of the Humming Birds (*Trochilidæ*). This beautiful work, appearing in parts at irregular intervals, was not completed until 1861, in which year Mr. Gould published, in convenient octavo form, his useful Introduction to the *Trochilidæ*. During the year of the first International Exhibition, Mr. Gould's collection of Humming Birds was exhibited at the Zoological Society's Gardens, in a building expressly set apart for the purpose. While the work on the Humming Birds was still in progress, he commenced his 'Birds of Asia' (1850-80), and this was followed in turn by 'The Birds of Great Britain,' five vols. (1862-73), with an octavo introduction to the same (1873), 'The Mammals of Australia' (1863), and 'The Birds of New Guinea' (1875-80). All these are in folio, with coloured plates. His account of the birds collected during the voyages of H.M.S. 'Beagle' and 'Surphur,' both of great interest to ornithologists, were published in quarto in 1841 and 1844 respectively.

Perhaps the most useful of Mr. Gould's octavo works is his 'Handbook to the Birds of Australia,' published in two vols. in 1865; for, appearing as it did nearly twenty years after the folio work on the same subject, it not only contained numerous additions and descriptions of new species, but gave to those who could not afford to purchase the more costly folio the latest information concerning Australian birds. At this date (1865) Mr. Gould was enabled to enumerate in round numbers no less than 660 species of Australian birds, the discovery of a great number of which was due mainly to his own exertions.

Elected a Fellow of the Zoological Society in 1840, having previously been a corresponding member, he took an active part in the scientific meetings, which were frequently enlivened by his accounts of the discovery of new and beautifully-plumaged birds which he exhibited. His descriptions and papers were published from time to time in the 'Proceedings of the Zoological Society,' the 'Zoological Journal,' and the 'Annals of Natural History.' The catalogue of scientific papers compiled and published by the Royal Society (of which Mr. Gould was a Fellow) shows that up up to the year 1873 no less than 229 separate papers had emanated from his busy pen.

It is impossible to review so large a contribution to zoological literature as is embodied in Mr. Gould's works without being convinced of two things. His publications have given the greatest possible stimulus and encouragement to the prosecution of zoological research, and the perfection to which he brought hand-coloured lithography may be said to have inaugurated a new era in the art of zoological illustration. No more beautiful coloured representations of mammals and birds can be found than those which adorn his own folios.

In this large series of beautiful volumes Mr. Gould has certainly raised an enduring monument to his own fame, for they will be quoted and referred to till the end of time.

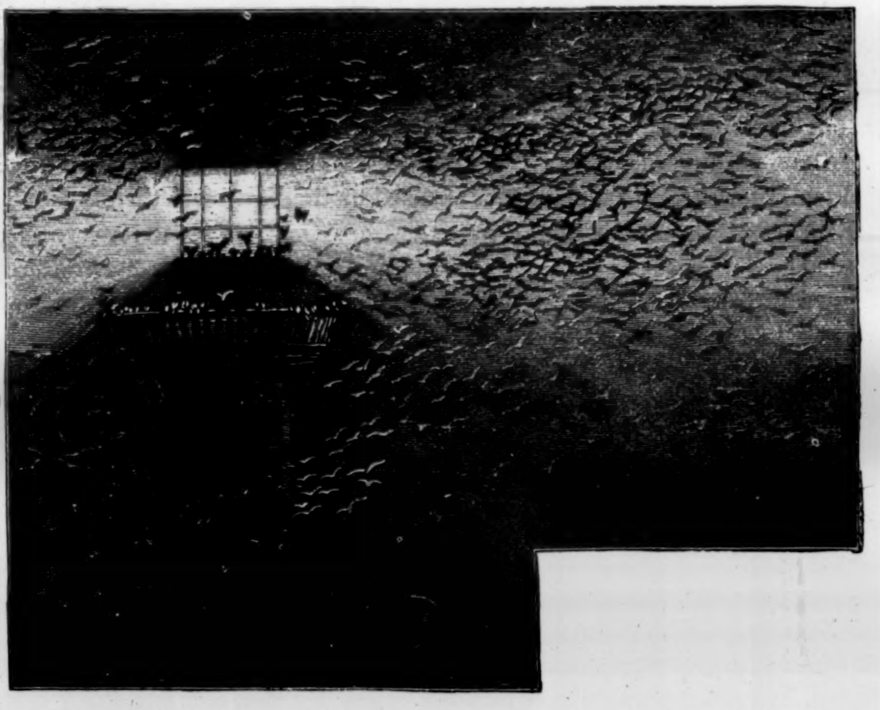
NOTICES OF NEW BOOKS.

Siberia in Europe; a Visit to the Valley of the Petchora in North-East Russia. By HENRY SEEBOHM, F.L.S., F.Z.S. With Map, and Illustrations by Charles Whymper and other Artists. London: John Murray. 1880. [Second notice.]

IN the review of this book, which appeared in our last number (p. 75), a curious mistake occurred in regard to the two illustrations there given. These, although originally prepared for the work, were not used, two others intended to represent the same scenes (pp. 175, 262), being substituted for them. None of them having been drawn by Mr. C. Whymper, who has furnished the best illustrations in this book, we have unintentionally done an injustice both to author and artist. Through the kindness of the publisher, however, we are now enabled to rectify this by giving three characteristic illustrations of bird-life from the pencil of Mr. Whymper, to which we will append Mr. Seebohm's observations relating to them.

WILLOW GROUSE.

On the tundra, near Stanavialachta, Willow Grouse, says Mr. Seebohm, "were as plentiful as Red Grouse on the Bradfield moors on the 12th. Their white wings, their almost entirely white bodies, made them very conspicuous objects. They usually rose within shot from a patch of willow cover. Sometimes we would see a pair knocking about the tundra, like two big white butterflies with a peculiar up and down flight, then they would go tumbling into a willow-grown knoll on the hill side. It might be owing to their extreme conspicuousness that their flight always seemed so much more clumsy than that of the Red Grouse. One of their nests which we found on the ground contained a baker's dozen of eggs. It was a mere hollow scraped in the turf, lined with a leaf or two, a little dry grass, and a few feathers."



THE LIGHTHOUSE AT HELIGOLAND ON A MIGRATION NIGHT.

On the subject of migration, as observed at Heligoland, Mr. Seebohm has some very interesting remarks (pp. 249—261). He visited this island on his return from Siberia, and arriving just on the eve of the autumnal migration, for the observation of which Heligoland is so admirably situated, he was naturally anxious to observe for himself what may be regarded as one of the most wonderful sights which can gladden the eyes of an ornithologist. The previously published observations of Mr. Gätke, of course, had already prepared him for a good deal, but his preconceived ideas on the subject, it would seem, fell far short of what he was enabled to realise by personal observation.

Being desirous of visiting the lighthouse at night, when large flocks of birds were passing over on migration, he requested that he might be called at the earliest opportunity which might present itself. He was accordingly awakened one dark night about half-past twelve with the news that the migration had commenced, and hastened at once to the shore. He thus describes what he saw:—

> "Arrived at the lighthouse, an intensely interesting sight presented itself. The whole of the zone of light within range of the mirrors was alive with birds coming and going. Nothing else was visible in the darkness of the night but the lantern of the lighthouse vignetted in a drifting sea of birds. From the darkness in the east, clouds of birds were continually emerging in an uninterrupted stream; a few swerved from their course, fluttered for a moment as if dazzled by the light, and then gradually vanished with the rest in the western gloom. Occasionally a bird wheeled round the lighthouse and then passed on, and occasionally one fluttered against the glass like a moth against a lamp, tried to perch on the wire netting, and was caught by the lighthouse man. I should be afraid to hazard a guess as to the hundreds of thousands that must have passed in a couple of hours; but the stray birds which the lighthouse man succeeded in securing amounted to nearly 300. The scene from the balcony of the lighthouse was equally interesting; in every direction birds were flying like a swarm of bees, and every few seconds one flew against the glass. All the birds seemed to be flying up wind, and it was only on the lee side of the light that any birds were caught. They were nearly all Sky Larks. In the heap captured was one Redstart and one Reed Bunting. The air was filled with the warbling cry of the Larks; now and then a Thrush was heard; and once a Heron screamed as it passed by. The night was starless, and the town was invisible; but the island looked like the outskirts of a gas-lighted city, being sprinkled over with brilliant lanterns. Many of the Larks alighted on the ground to rest, and allowed the Heligolanders to pass their nets over them. About three o'clock a.m. a heavy thunderstorm came on, with deluges of rain; a few breaks in the clouds revealed the stars; and the migration came to an end, or continued above the range of our vision.

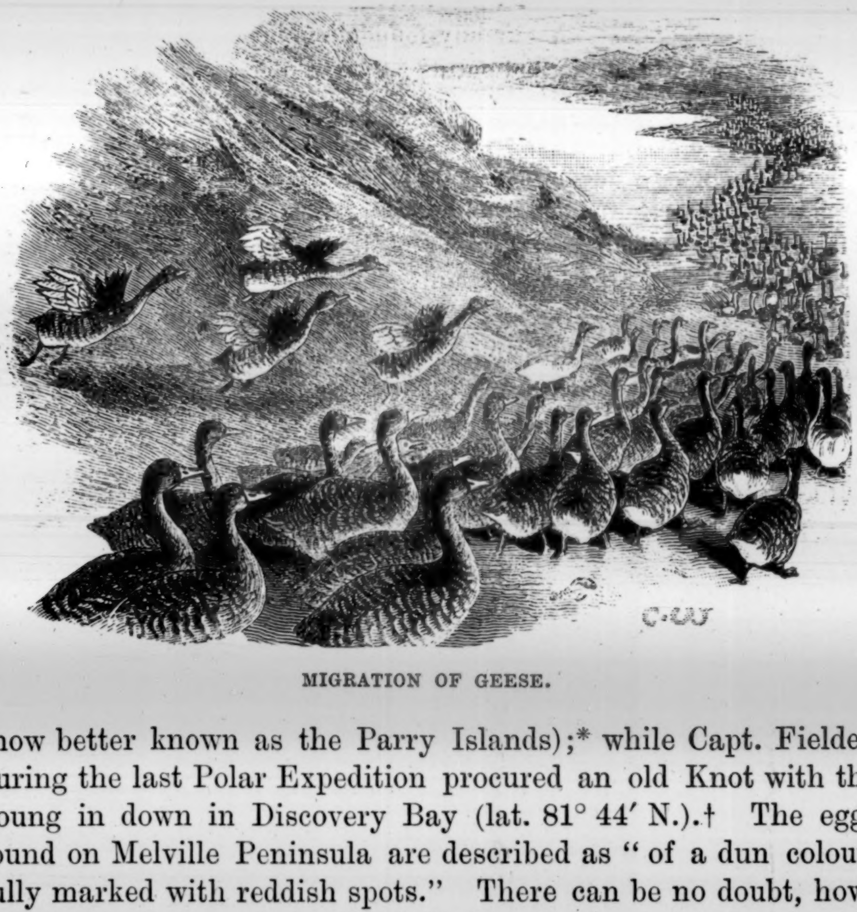
"The conclusion I came to after my Heligoland experience was that the desire to migrate was an hereditary impulse, to which the descendants of migratory birds were subject in spring and autumn, which has during the lapse of ages acquired a force almost, if not quite, as irresistible as the instinct to breed in spring. On the other hand, the direction in which to migrate appears to be absolutely unknown to the young birds in their first autumn, and has to be learnt by experience. The idea that the knowledge of where to migrate is a mysterious gift of Nature, the miraculous quality of which is attempted to be concealed under the semi-scientific term of instinct, appears to be without any foundation in fact. It appears that each individual bird has to find out its proper winter quarters for itself, and learn the way thither as best it may. That birds have keen organs of sight is a fact well known to all who have watched them obtaining their food or eluding their enemies. That they must have wonderful memories for place is shown by the distance they roam from their nests, and the concealed spots in which they seem to have no difficulty in finding them again. Amongst true migratory birds, that is amongst birds which have a winter as well as a summer home, as distinguished from gipsy migrants who perpetually loaf about on the outskirts of the frost during winter, continually changing their latitude with the temperature, it appears to be a general rule that the farther north a species goes to breed the farther south it goes to winter. It is not known if this applies to individuals as well as to species."

Apropos of this subject, we may refer to a curious migration of Wild Geese, of which an illustration is given, observed by Mr. Seebohm while crossing the interior of the tundra near Bolvanski Bucht. He says (p. 282):—

"I had not gone more than a mile when I heard the cackle of geese. A bend of the river's bed gave me an opportunity of stalking them, and when I came within sight I beheld an extraordinary and interesting scene. One hundred, at least, old geese, and quite as many young ones, perhaps even twice or thrice that number, were marching like a regiment of soldiers. The vanguard, consisting of old birds, was halfway across the stream; the rear, composed principally of goslings, was running down the steep bank towards the water's edge as fast as their young legs could carry them. Both banks of the river, where the geese had doubtless been feeding, were strewn with feathers, and in five minutes I picked up a handful of quills. The flock was evidently migrating to the interior of the tundra, moulting as it went along."

When referring in our former notice of this book to the breeding of the Curlew Sandpiper (p. 79), we alluded to the

Knot, *Tringa canutus*, as one of the birds whose nesting haunts still remain undiscovered, and whose eggs still remain to be described. This is not quite accurate, for although we have never seen an authenticated egg of this bird, and are not aware that one is to be found in any collection in Europe, it is nevertheless true that the Knot was found years ago breeding on Melville Peninsula, as well as on the North Georgian Islands (now better known as the Parry Islands);* while Capt. Fielden during the last Polar Expedition procured an old Knot with the young in down in Discovery Bay (lat. 81° 44′ N.).† The eggs found on Melville Peninsula are described as "of a dun colour, fully marked with reddish spots." There can be no doubt, however, that we have yet a good deal to learn about the nesting habits and haunts of this species.



MIGRATION OF GEESE.

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* See Sabine, Greenl. Birds, p. 533; Parry's First Voy., Suppl., p. 201: Parry's Second Voy., Append., p. 355; Richardson and Swainson, Faun. Bor. Am. (Birds), p. 387.

† See 'The Ibis,' 1877, p. 407, and Nares's Voy., Append. vol. ii., p. 211.